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## EDUCATION AND EVOLUTION

It is obviously true, as Compayré has said, that "decisive changes in human opinion—political, religious, or scientific—involve corresponding changes in the purpose and methods of education." It was, therefore, to be expected that the most decisive change in modern thought, namely, the change effected by the biological theory of development presented by Darwin, in 1859, would involve revolutionary changes in the field of education. Such expectation, however, if it has been cherished, can hardly be said to have been fulfilled. Resultant effects of the theory of evolution upon education are, to be sure, numerous and important, but they are almost inconsiderable in comparison with the changes wrought by the same theory in the biological sciences. Educational doctrines have been almost as impervious to the stream of evolutionary thought as the incrustated creeds of theology.

If we inquire after the cause of this phenomenon, we have not far to seek. In education, as in theology, it is the conservative influence of authority. Modern educational doctrines are to a considerable extent an inheritance from the pre-evolutionary epoch of German, French, and English philosophy. Our educational thinkers have been chiefly employed in the interpretation, the elaboration, and the application of the doctrines of Bacon, Locke, Comenius, Rousseau, Basedow, Pestalozzi, Froebel, and Herbart, all of whom lived and died before Darwin's immortal work on the origin of species was published. Herbart, for instance, the latest of those just named, and whose system of education has awakened so much interest and is now attracting so much attention, died in 1841, eighteen years before the theory of natural selection was clearly

propounded.<sup>1</sup> The conservative influence of these early educationists upon educational theory has been similar to that of the Christian Fathers upon theology. It has tended to turn back the tide of evolutionary thought from the field of education.

It would be a mistake to interpret what has just been said as indicating lack of reverence for the great men whose educational theories we have inherited, or failure to recognize the inestimable value of their teachings. It would be presumption, as well as ingratitude, to intimate that the educational world attaches undue importance to the doctrines of such educators as Herbart, Froebel, or Pestalozzi. No such thought is in mind. What I do assert is that allowance should be made for the fact that the thought of these men, and the other founders of modern educational philosophy, was uninfluenced by the theory of organic evolution, and should be corrected in the light of it. Reverence for the educational Fathers does not demand that we overlook their limitations. Their doctrines, like those of their contemporaries, must be informed with the newer thought. Evolutionary ideas must be given free course, in education as in biology. The change they are destined to produce in the purpose and methods of education has only been begun. Educational philosophy will yet be rewritten from the standpoint of evolution.

There are many teachers, and even some writers on the subject of education, who do not accept the evolutionary hypothesis. It is only an hypothesis, they say, and, as for themselves, they mean to await demonstrative evidence before accepting it. This is a strange position to assume. The hypothesis-rejecting attitude is supposed by some to manifest a judicial habit of mind, but it more frequently betrays indifference to the questions at issue. No one can think long on the subject of how the world, or any part of it, became what it is, without accepting some kind of hypothesis. Evolution has

<sup>1</sup> Horace Mann died in 1859, the same year in which Darwin's book appeared. Rosenkranz's *Philosophy of education*, altho it originally appeared in 1848, is still a standard text-book in our educational libraries. Other facts illustrating the idea of the text will suggest themselves to the reader.

thus far proven to be the most rational explanation. No failure has yet been recorded against it. No other conception or theory of the universe has any standing in the court of science. It is the only theory that has any scientific evidence in its favor. Rejection of it as a working hypothesis is inconsistent with an eager desire for the truth.

Evolution, however, is something more than a working hypothesis. Long ago Professor Huxley declared that "the evolution of many existing forms of animal life from their predecessors is no longer an hypothesis, but an historical fact."<sup>2</sup> Other competent students of nature have asserted positively that the doctrine of the descent of multicellular animals from unicellular, of amphibious animals from fishes, of birds from reptiles, of the placental mammalia from the marsupials, and of man from some lower apelike form rests upon an incontrovertible basis of fact. "The general theory of descent," says Haeckel, "claims full and permanent value, because it is inductively based on the whole range of common biological phenomena and on their internal causal connection."<sup>3</sup>

The evidence supporting the conclusion just expressed cannot even be touched upon here. Readers who may happen to be unfamiliar with this evidence can only be referred to the books which present it in detail.<sup>4</sup> To those who are still awaiting the discovery of "the missing link," or the actual observation of the transmutation of one existing species into another, before admitting their belief in the theory, I commend Professor Huxley's chapter on "The demonstrative evidence of evolution."<sup>5</sup> "An inductive hypothesis," said Professor Huxley, "is said to be demonstrated when the facts are shown to be in entire accord with it. If that is not scientific proof, there are no merely inductive conclusions which can be said to be proved. And the doctrine of evolution, at the

<sup>2</sup> *Encyclopædia Britannica*, article on "Evolution."

<sup>3</sup> *Freedom in science and teaching*, p. 13.

<sup>4</sup> Of the numerous books on the subject of evolution the following may be recommended to those who have not read upon the subject: Darwin's *Origin of species*, and his *Descent of man*; Romanes's *Darwin and after Darwin*, vol. i, and Drummond's *Ascent of man*.

<sup>5</sup> See *Lectures on evolution*, No. 3.

present time, rests upon exactly as secure a foundation as the Copernican theory of the motions of the heavenly bodies did at the time of its promulgation. Its logical basis is precisely of the same character—the coincidence of the observed facts with theoretical requirements.”<sup>6</sup> So far as the present discussion of education and evolution is concerned, the theory of evolution, with all its legitimate implications, is accepted by the writer as the most rational world hypothesis thus far conceived. The evidence in support of it is regarded as overwhelming and convincing.

Regarding evolution, then, as the correct explanation of the universe, our present purpose is to show the place of education in the general evolutionary process, and its relation to organic evolution as a whole. Let us consider first the place of education in the cosmic process.

“The general doctrine of development,” says Professor Haeckel, “the pro-genesis theory or evolution-hypothesis (in the widest sense, as a comprehensive philosophic view of the universe) assumes that a vast, uniform, uninterrupted, and eternal process of development obtains thruout all nature; and that all natural phenomena without exception, from the motion of the heavenly bodies and the fall of the rolling stone to the growth of plants and the consciousness of men, obey one and the same law of causation.”

This general theory of the world process is, of course, all-inclusive. It applies to inorganic, organic, and superorganic phenomena. There is no break in it. Some who accept it in a general way think it does not apply to the origin of life and mind, or to the development of the spiritual faculties. Such a view, however, is inconsistent with a belief in the theory of evolution. It may be that no experimental evidence in regard to the origination of life, for instance, will ever be provided. And yet, by an act of scientific faith, we conclude that the organic world has evolved naturally from the inorganic. “Biologists in general,” says Mr. Spencer, “agree that, in the present state of the world, no such thing happens as the rise of a living creature out of non-living matter. They do not deny,

<sup>6</sup> *Op. cit.*, p. 35.



however, that at a recent period in the past, when the temperature of the earth's crust was much higher than at present, and other physical conditions were unlike those now, inorganic matter, thru successive complications, gave origin to organic matter. So many substances once supposed to belong exclusively to living bodies have now been formed artificially, that men of science scarcely question the conclusion that there are conditions under which, by yet another step of composition, quaternary compounds of lower types pass into those of highest types. That there once took place gradual divergence of the organic from the inorganic is, indeed, a necessary implication of the hypothesis of evolution, taken as a whole." Similar expressions might be quoted from Professor Huxley and other competent authorities.

The evolutionary process, then, is one and continuous. Nature and art, organic, psychic, and social evolution, and consequently education, are all embraced in its universal sweep.

Education, however, deals only with sentient beings. It, therefore, belongs within that part of the cosmic process known primarily as organic evolution. We may, therefore, dismiss the general conception of the world process, and confine our attention to the evolution of organic beings.

Organic evolution, as almost everyone must know, is the description of that series of morphological and psychological changes which organic beings have undergone since the appearance on this planet of living matter. Psychic and social evolution are its concomitants. Man, no less than the lower organisms of the animal and vegetable kingdoms, must be considered as its product. The theory applicable to this department of evolution may be briefly presented by introducing here a passage from Romanes' *Scientific evidence of organic evolution*.

It is a matter of observable fact [says Professor Romanes] that all plants and animals are perpetually engaged in what Mr. Darwin calls a "struggle for existence." That is to say, in every generation of every species a great many more individuals are born than can possibly survive; so that there is in consequence a perpetual battle for life going on among all the constituent individuals of any given generation. Now, in this struggle for existence, which individuals will be victorious and live? Assuredly those which are

best fitted to live; the weakest and the least fitted to live will succumb and die, while the strongest and the best fitted to live will be triumphant and survive. Now it is this "survival of the fittest" that Mr. Darwin calls "natural selection." Nature, so to speak, selects the best individuals out of each generation to live. And not only so, but as these favored individuals transmit their favorable qualities to their offspring, according to the fixed laws of heredity, it follows that the individuals composing each successive generation have a general tendency to be better suited to their surroundings than were their forefathers. And this follows, not merely because in every generation it is only the flower of the race that is allowed to breed, but also because, if in any generation some new and beneficial qualities happen to appear as slight variations from the ancestral type, these will be seized upon by natural selection and added, by transmission in subsequent generations, to the previously existing type. Thus the best idea of the whole process will be gained by comparing it with the closely analogous process whereby gardeners and cattle-breeders create their wonderful productions; for just as these men, by always selecting their best individuals to breed from, slowly, but continuously, improve their stock, so Nature, by a similar process of selection, slowly, but continuously, makes the various species of plants and animals better and better suited to the external conditions of their life.

Now, if this process of continuously adapting organisms to their environment takes place in Nature at all, there is no reason why we should set any limits on the extent to which it is able to go, up to the point at which a complete and perfect adaptation is achieved. Therefore we might suppose that all species would attain to this condition of perfect adjustment to their environment, and there remain fixed. And so undoubtedly they would, if the environment were itself unchanging. But forasmuch as the environment—or the sum total of the external conditions of life—of almost every organic type alters more or less from century to century (whether from astronomical, geological, and geographical changes, or from the immigrations and emigrations of other species living on contiguous geographical areas), it follows that the process of natural selection need never reach a terminal phase. And forasmuch as natural selection may thus continue *ad infinitum*, slowly to alter a specific type in adaptation to a gradually changing environment, if in any case the alteration thus effected is sufficient in amount to lead naturalists to denote the specific type by some different name, it follows that natural selection has transmuted one specific type into another. And so the process is supposed to go on over all the countless species of plants and animals simultaneously—the world of organic types being thus regarded as in a state of perpetual, tho gradual, flux.

Such is the theory of natural selection. It is the story of how nature has schooled her children to a conformity with the requirements of their environment. It is not the whole account, of course, of organic and social evolution, but it has played a larger part in it than is usually recognized. In social

evolution it is assisted by various factors within the group, but it continues to operate not only upon organic structures, but upon ideas, customs, institutions, and upon the groups themselves. As in the general process, so here in this part of it, there is no break. From monads to man in his highest perfection there is continuous development. In this fact is the most rational sanction of our hope for man's future. "Thoughtful men," says Professor Huxley, "once escaped from the blinding influences of traditional prejudice, will find in the lowly stock whence man has sprung the best evidence of the splendor of his capacities, and will discern in his long progress thru the past a reasonable ground of faith in his attainment of a nobler future."<sup>7</sup>

Since man, then, however highly educated he may be, is in the strictest sense a lineal descendant of the protoplasmic organisms which were the first inhabitants of this planet, a product of all the forces which have impinged upon him from the beginning, education in the ordinary sense is, as applied to the individual, merely a factor in organic evolution. 3

It is worth while to notice in this connection that the period covered by formal or school education, as far as the entire development of the individual is concerned, is a mere moment of time. Infinite is the word we apply to the inorganic process. A hundred million years perhaps would no more than span the period between man as we know him and the primordial forms of life. A score of years at most suffices to cover the school period in the life of a single individual. Education, then, as a factor in individual development is applied for only a few years near the end of the process of the development of the individual thru a series of ancestral forms. School experience is, so to speak, the finishing shop of nature. How slight, then, after all is the opportunity of the teacher. Nature has almost completed her product before it is placed in his hands. 6

The brevity of the school period in comparison with the experience of the individual, actual and inherited, is not, however, the most striking or the most significant fact revealed by the 7

<sup>7</sup> *Man's place in nature* (Humboldt Library Series, No. 41), p. 234.

consideration of education in the light of evolution. There is another suggestion of somewhat more practical significance.

In the brief account of the theory of natural selection, quoted from Romanes, the use of the words transmutation and adaptation must have been noticed. Organic evolution, it was shown, is the process of adapting the organism to its environment. Now, after all that has been said about the difficulty of defining education, we shall not be far wrong in asserting that it, too, is primarily a process of adaptation. It is the adaptation of the individual to a physical and social environment, actual or ideal. The whole process of organic evolution, therefore, may be looked upon as essentially an educational process. Education may not only be regarded as the homologue in the social world of evolution in the organic world, but the meaning of the term education may be extended to include the whole developmental process of the individual from the beginning of life.

This may seem to be an unwarranted extension of the idea of education. It is a common observation, however, that education does not begin or end with life in the school. We speak of the education of the home, and the education of experience with men and things. May we not also extend the thought, so as to include prenatal and ancestral experience back to the point which marked the real beginning of the individual's life? This is the view we shall now take for the purpose of showing the relation between school experience, or education in the narrow sense, and organic evolution, or education in its widest signification. Regarding the education of the individual, then, as having been begun with the experience of his primordial and protoplasmic ancestor and continued on down thru the life of the race, we may roughly divide the process into the education which nature, in the narrow sense, has carried on, and the education which has been consciously provided by intelligent beings. The first we may call natural or genetic education, and the second artificial or telic. The former is the spontaneous education which the individual has received as the inevitable result of his experience; the latter, the experience which has been consciously designed to produce educational

results. One is the work of nature; the other is the conscious work of man.

Natural or genetic education, then, is the modifying and adaptive process which organic beings have undergone thru the operation of external forces, physical and social. In the case of an individual human being its results include all the morphological and psychological changes which have been unconsciously produced in himself, and in the long series of organic beings of which he is the last term. Its results are summed up in him in the special characteristics of form and function due to his heredity, and in the additional increments of his development which are to be set down as the unintended educational results of his life experience. This natural educational process is specifically recognized by M. Letourneau, who, in a passage in his *L'évolution de l'éducation*, declares that every human being, as well as every animal, is the result of influences undergone organically and mentally by its ancestors. These influences, he says, have constituted for the species a *spontaneous education*, the traces of which are profoundly imprinted, organically and mentally. These influences spring from different causes: from the action of climate, from the physical environment to which their progenitors have had to accommodate themselves. In human society they result in large measure from the action of the social environment, especially from the kind of life which from the remotest times our ancestors have been subjected to or have themselves adopted.

The natural education of man may be divided at the point where he enters upon life in a social group, that is, at the origin of society. Prior to that time nature was wholly engaged in educating him for or adapting him to life in his physical environment. This we may call natural physical education. The process continues, of course, thru his life in the social group, but at the origin of society there began another stage of the educational process, whereby he has been progressively adapted to life in a social environment. This phase of the educational process I shall call natural social education. Compayré expressed the idea when he said "there is not only an education properly so called, that which is given in schools and

which proceeds from the direct action of teachers, but there is a natural education which we receive without our knowledge or will, thru the influence of the social environment in which we live.”<sup>8</sup> This form of education results from the interaction of personalities, from the influence of institutions, and from the action of the group upon its individual members. The enormous influence of these factors in molding the form and character of the individual will not be questioned. Life is in reality a school, in which experience is the teacher. The unconscious influence of persons and institutions ceaselessly operates to mold human character. The social structure is itself a significant educational factor. “As soon as a social combination acquires some permanence,” says Herbert Spencer, “there begin actions and reactions between the society as a whole and each member of it, such that either affects the nature of the other. The control exercised by the aggregate upon the units is one tending ever to mold their activities and sentiments and ideas into congruity with social requirements.”<sup>9</sup> So much for the natural physical and the natural social education of the individual.

We have shown that natural or genetic education, the first great division of the educational process, may be subdivided into physical and social education; that physical education results in adaptive morphological and psychological changes, and that social education continues the process by molding the individual into conformity with social environment. Let us now glance at the end towards which the evolution of individual forms seems to be directed, and the manner in which that end is approximately reached. In other words, tho, scientifically speaking, the terms employed are unwarranted in this connection, let us consider the aim, means, and methods of natural education.

I say that the use of such terms as aim and method in describing the process of nature is unwarranted, for, so far as the vision of science can penetrate, nature has neither aim nor method. “Method,” says De Greef, “is the loftiest process of

<sup>8</sup> *History of education*, preface.

<sup>9</sup> *Principles of sociology*, vol. i, p. 12.

individual intelligence.”<sup>10</sup> Unless we attribute intelligence to nature, and we should step out of the boundaries of science in doing so, we are prevented from speaking of the aim and methods of nature except in a figurative sense. Recognizing the accommodation of language in the use of teleological terms to describe the process of nature, we may speak, however, as if Nature in educating her children sets up an aim, and employs means and contrives methods to realize her aim.

The aim of nature, then, in the development of organic beings, that is to say, the aim of natural education, whether physical or social, is that condition of the organism at which the evolutionary process comes to a standstill. This condition is usually expressed as adaptation to the environment. Whether the process leads to the improvement of the type or to the opposite, the aim of natural education is realized when adaptation is complete. In the case of certain organisms this adaptation has practically been reached. Almost if not quite perfect equilibrium between the forces of the organism and the forces of the environment has been established. Some of the lower forms of animal life seem to have undergone little or no change since a very early geological epoch. In this respect man himself has almost reached a stationary state. We have neither historical nor paleontological evidence that his form has undergone any marked changes since the beginning of society. Except in his improved brain structure he has preserved the type prevalent in the eocene epoch. The fossil human remains of Spy, Neanderthal, Engis, Furfooz, and Java indicate some differences in form from the man of to-day, but they are not sufficient, according to some authorities, to warrant the classification of any of these types in a new genus. Man's physical education is, therefore, all but complete. As far as his general structure is concerned, the work of nature seems practically to be accomplished. His psychological development, however, while it probably involves some changes in organic structure, seems destined to go on forever. The aim of nature will never be realized for the reason that the environment of an intellectual creature like man is necessarily

<sup>10</sup> *Introduction à la sociologie*, preface.

unstable and changing. The same may not be said of animals of a lower order living in a practically stable environment. Whatever the conditions, however, or whatever the organic being under consideration, the aim of nature is always the same, namely, adaptation to environment.

Let us now consider the means employed by nature to realize her scholastic aim.

The word means, as applied to education, denotes the material and psychical instruments employed in the production of educational results. Unless we confine ourselves in this discussion, however, to the material objects employed, we shall confuse the means of natural education with its methods. The means of natural education, then, are the physical and social environment. This, to be sure, in the proper sense of the word, is no means at all. Nevertheless we may say that it is by the impinging forces of the environment acting upon the organism that nature produces all her results. She has no school but the world, no teacher but experience. The absurdity of "following nature," in any literal sense, in the work of the school is here most conspicuously presented.

Turning now to notice the method employed in natural education, we find that, so far as physical education, natural and social, is concerned, it may be roughly described by the word selection. Natural and sexual selection are the chief methods by which nature has developed all her various and wonderful organic forms. A casual examination of these so-called methods, however, reveals the accommodation of language in the use of the term as applied to the process of nature. It has been described as the method of trial and error. It consists in the practically unlimited production of living forms and the survival of the few which do not succumb to the hostile environment. The seeds of life are scattered profusely and indiscriminately. As Professor Ward has said, "not only must we conceive the effort as proceeding from the center of a circle, but we must absolutely conceive it as proceeding from the center of a sphere."<sup>11</sup> And again he says, "while every crea-

<sup>11</sup> *Outlines of sociology*, p. 254. See also *Psychic factors of civilization*, chapter xxxiii.



tion of organic nature has within it the possibility of success, that success is only secured by the multiplication of chances." The natural process therefore takes place without a method in the proper sense of the term. And here again is illustrated the absurdity of imitating in education the processes of nature. Calling selection a method, however, we can see that it involves three factors, namely, variation, heredity, and the struggle for existence. These might be regarded as means, for by the variations which, to indicate our ignorance of the causes which produce them, we call spontaneous, an opportunity for selection is afforded. By heredity nature preserves the stored-up results of experience, and by the struggle for existence she eliminates the individuals and types which do not conform to the necessities of the environment. In natural social education suggestion, imitation, and repetition play an important part. The method of development, however, may still be described as selection.

Now, in the practical work of the school, it is sometimes forgotten that the natural educational process is going on just the same as in extra-scholastic or in subhuman experience. Whether the teacher is conscious of it or not, natural influences are ever busy in supplementing or counteracting her efforts. The education of nature may be slow and imperceptible, but it is absolutely inevitable and continuous. The methods of the teacher are applied during only a part of the day, but the methods of nature are in perennial operation. Our schools and colleges have their commencement exercises, indicating that in the case of certain individuals their work is complete, but there are no graduates from the school of nature. Sometimes the great Teacher of us all works with considerable rapidity. The process of imitative selection, for instance, is swift and, when undirected by a skillful teacher, may undo the results of artificial methods. Everyone will recall the memory of some teacher whose valuable precepts were rendered ineffective by the swift influence of his bad example. The study of the aim, means, and methods of nature is important, not that we may follow nature, but that we may utilize her forces in improving upon her work.

Turning now to the second great division of the educational process, the artificial or telic, we may define it roughly as that part of the educational process which is consciously directed. The fundamental distinction between this form of education and natural education is the employment of a teleological element. In artificial education man has become conscious of the natural process and seeks to control it. Artificial education is natural education directed towards a preconceived end. This implies not only an educational aim consciously set up, but the employment of means and the devising of methods to realize the aim. Here, however, as in all art, the process is one of controlling the forces of nature. These are exactly the same as those unconsciously operating in natural education. Artificial education is not an entirely new and distinct process; it is the old one under more or less conscious direction.

The form of education now under consideration may result either from the conscious effort of one person to modify the development of another, or the conscious effort of an individual to modify his own development. In the former case the teleology is exerted by someone other than the being educated. It is objective. To this kind of education I have applied the term altrotelic, the components of which plainly enough indicate its meaning. In the latter case, the teleology is a function of the being undergoing the educative process. It is subjective. This form of education may be fitly described by the word autotelic. Artificial education, then, may be subdivided into objective and subjective or, as I prefer, altrotelic and autotelic.

The continuity of the educational process is illustrated by the gradual shading off of natural education into artificial, or *vice versa*. No hard-and-fast line can be drawn between them. The same thing is true as regards the natural and artificial evolution of society. In attempting to establish a distinction between genetic and telic social progress Professor Ward says, "On the subhuman plane the organic advances that nature accomplishes all take place according to the genetic principle. They constitute what is commonly understood as development or organic evolution. When we take in human evolution it be-

comes evident that it includes something more than is involved in the evolution of irrational beings. The moment we rise to the social sphere we encounter the *telic* aspect of the subject. It is still development or evolution, but a new principle, radically different from the genetic, has now been introduced and in all the higher forms of social progress it assumes the leading rôle."<sup>12</sup> This new factor, to which Professor Ward refers, is the intellectual faculty, but, as it made its appearance in the evolutionary process by a series of imperceptible changes, so it introduced itself into the educational process in the same gradual manner. One or two examples may serve to illustrate this idea.

On the border line of artificial education, and serving as a sort of link between the natural and the artificial process, is the instinctive education which appears in the subhuman world. As has been said before, the animal, of whatever species, is born like man with a latent inherited education, the effects of which are manifested in the course of its individual development. Certain birds and beasts, however, add to this inherited education an education conducted by the parent in much the same way as artificial education is practiced in human society. Certain birds, for instance, may be observed teaching their young to fly or to swim. The bear teaches her cubs to walk, to climb, and to eat. Similar facts might be adduced to illustrate education in the animal world. This education, however, is only analagous to, and not identical with, the artificial education of the home and the school. It is conscious, but not purposive. Its results are not foreseen and intended. The practice of it is due to natural selection, aided possibly by incipient reason. It is owing to its resemblance to *telic* action, and to the possibility of its being such at bottom, that we may be warranted in classifying it under artificial education.

Just over the line, but plainly within the limits of the *telic* process, is the education by man of the domestic animals. Here the facts of nature, variation, and heredity, are duly taken account of, and the selective power which nature formerly exercised is now in the hands of man. The primary

<sup>12</sup> *Outlines of sociology*, p. 179.

method is artificial selection. The principle, however, is not different from that of natural selection. The factors are the same, viz., variation, heredity, and environment, but man, a conscious selective agent, has become a part of the environment.

Now, it may seem far-fetched and futile, if not absurd, to institute a comparison between the education of the school and the work of the breeder, trainer, or fancier. And yet, in some respects, they are identical. They are dealing with the same forces, their material is sentient beings, of different degrees of possible development, to be sure, but animals just the same. Nothing is gained by forgetting that man, however noble in reason, infinite in faculty, or express and admirable in form or moving, has, after all, a biological origin. In the work of the school, until a certain stage of the development of the pupil is reached, there is the same unconsciousness on the part of the being instructed, so far as the meaning of the process is concerned, as there is in the education known as artificial selection and training. The chief difference between the two processes is the number and character of the limitations imposed upon the teacher. The breeder or fancier is not restrained by sentiments of humanity or by legal enactment from rejecting or eliminating the types which he does not approve. For obvious reasons the teacher cannot proceed to this extremity, no matter how earnestly he may occasionally desire to do so. The teacher is handicapped by the necessity of developing each individual as far as possible in the direction of the ideal type. He cannot control heredity. He is compelled, much more than the breeder, fancier, or trainer, to subject himself to the natural process. The selective function assumed in artificial selection is, so far as the teacher is concerned, still in the hands of nature and society. Artificial selection and the training of the lower animals, however, is only a stage in the educational process. It lies clearly within the altrotelic division.

Proceeding upward thru subhuman education and artificial selection and training, we arrive at the highest form of altrotelic education, namely, the work of the school. There is no break,

we repeat, between school education and education out of the school. Even if, as Professor Huxley maintained in his celebrated Romanes lecture, the ethical process runs counter to the remainder of the cosmic process, there is no gap between them. The school itself, altho a means for improving upon nature, is at the same time a product of the evolutionary process. As the poet has said,

“ Nature is made better by no mean,  
But nature makes that mean : over that art  
Which you say adds to nature, is an art  
That nature makes.”

Artificial education is, as the name implies, an art—an art which is most conspicuous in the school, but, as a matter of fact, the school is not an essential element in education. It is merely an incident in social progress. It is a means which society has constructed for economizing social energy. Mark Hopkins on one end of a log and Garfield on the other represent formal education as truly as any university or school, but society has not a sufficient number of Mark Hopkinses to warrant it in delegating them to individual instruction. Hence the saving appliances known as the school, the college, and the university.

In the school, education begins as an altrotelic process. The teacher conceives the aim, and strives with more or less intelligence of plan to realize it. He employs the available means which he regards as most effective, and devises or adopts methods which he thinks are the most intelligent, to achieve the end he has in view, namely, the approximation of an ideal individual type. Method in education, as in every department of human effort, implies an endeavor to economize. All improvement in teaching, the aim and means being constant, may be roughly represented as an increase in economy. Now when, in the education of an individual, is the highest degree of economy reached? Is it not when the pupil himself becomes conscious of the educational aim and, taking his education into his own hands, strives with consciously adapted effort to realize his aim? Every teacher must have observed how such a pupil, awakening to a consciousness of the meaning and value

of the educative process in his own case, forges ahead of his companions. The reason for his accelerated development is obvious. His activities are now self-ordered for the attainment of a definite end. He sees the goal and strives for it. In the interplay of his activities there is less friction, less counteraction of forces, less waste of time and energy. He has assumed the task of the teacher, who now tends to become useless until finally his energy, so far as that pupil is concerned, may be released for application elsewhere. Subjective or autotelic education is, then, the loftiest stage of the educational process. It represents the possibility of the nearest approach to ideal economy. From the beginning of natural education there is a gradual movement towards the self-conscious stage. Every step in that direction is accompanied by an improvement in the matter of eliminating waste. This thought will carry a wider significance when we come to consider education as a factor in social transformation.

To sum up, the general educational process may be divided into natural education and artificial education. Natural education falls into the divisions physical and social. Artificial education is merely a continuation, an extension, an acceleration of the natural process. Its distinguishing element is the telic or intellectual factor applied to the achievement of educational ends. It is purposive. It falls into altrotelic education, or that which is directed by others than the being educated, and autotelic, or that which is self-directed. These divisions, with their respective aim, means, and methods, always remembering that these words are used figuratively with respect to natural education, may be shown by the analysis on page 78.

If the foregoing description and analysis of the process of individual development are warranted by the facts, and artificial education is the continuation, extension, direction and acceleration of a process already begun, certain implications in regard to educational theory may be easily discerned.

In the first place, the conscious attempt to educate an individual is an interference with the process of nature. It is an attempt to direct or to control forces resident in the individual and his environment. It is, therefore, a negation of *laissez-*

EDUCATION OF THE INDIVIDUAL	AIM	MEANS	METHOD	ILLUSTRATION
Natural or Genetic.....	Adaptation	Organism and environment	Selection	
Physical.....	Adaptation to physical environment	Organism and physical environment	Natural selection (involving variation, heredity, and struggle for existence)	Evolution of animal forms
Social.....	Adaptation to social environment	Organism and social environment	Natural and social selection (involving suggestion, imitation, repetition, and choice)	The education of social experience
Artificial or Telic.....	Adaptation (ideal)	Organism and artificial environment	Artificial selection and modification of the environment	
Altrotelic.....	Production of ideal individual type	As above (school, books, apparatus, etc.)	Telic devices for economizing time and energy	Animal education. Breeding and training "Schooling"
Autotelic.....	Self-realization of ideal individual type	As above	As above with conscious inhibition and choice	Self-conscious and self-determined education

*faire*, so far as individual development is concerned. Whatever the cry, "back to nature," may mean as applied to education, it should not be interpreted as a demand to approximate the natural process in the work of the school. Everything that is done in artificial education is a "meddling" with natural processes. Against such action in itself no valid objection can be raised. It is only with reference to unwise efforts to control or direct the forces of individual education that such procedure may be properly condemned. The bungling teacher, like the bungling legislator, may do more harm than good, but intelligence may economize in the field of education as in the field of politics. The perfection of education is

in bringing under the control of intelligence every factor engaged in the process, and the direction of each toward the common end of producing the highest conceivable individual and social type.

In the second place, and implied by what has just been said, the teacher should have at least a general acquaintance with the evolutionary process in which he is a factor. The unvarying laws of individual and social development lie at the basis of his work. Without a knowledge of these laws, he is like a would-be inventor who does not understand the material with which he deals or the forces he tries to utilize. He undertakes the impossible, aims at an unattainable goal, grows enthusiastic over irrational methods, and widely miscalculates educational values. In short, he is an empiricist and illustrates the extravagances and prodigality of empiricism wherever it is practiced. Every teacher, then, should have a general course on evolution, and the school in which teachers are trained for their work should provide and prescribe such a course. "Grant," says Herbert Spencer, "that the phenomena of intelligence conform to laws; grant that the evolution of intelligence in a child also conforms to laws; and it follows inevitably that education cannot be rightly guided without a knowledge of those laws. To suppose you can regulate the process of forming and accumulating ideas without understanding the process is absurd."<sup>13</sup> We have shown, however, that education is not only the process of "forming and accumulating ideas," but is essentially a process of evolution. The whole process, therefore demands primary consideration by all those who would labor in the field of education.

It may be argued also that, in addition to a general knowledge of evolution, the teacher should cultivate as a pastime, if not for its immediate practical utility, some branch of natural science. No other pursuit will so thoroly familiarize him with natural processes. By no other study can he so effectively cultivate the scientific habit of mind, which is indispensable to successful teaching. It will reveal to him the intimate relation between his art and all other arts; that they all proceed on

<sup>13</sup> Quoted by S. de Brath in *The foundations of success*, p. 20.



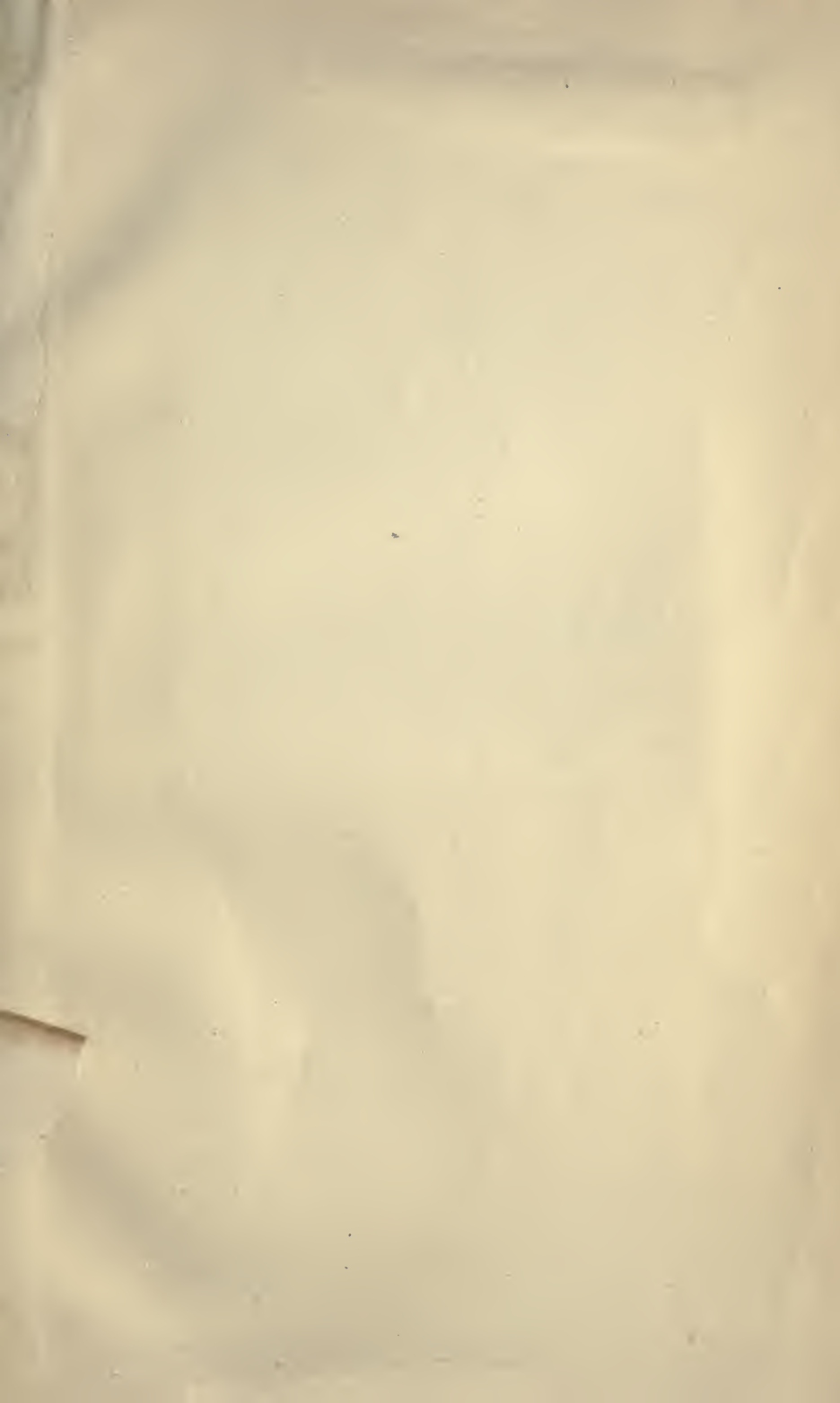
the same assumption, namely, universality of law and the constancy of the order of nature.

Finally, in considering the individual as "the 'last inheritor and the last result' of all the conditions that have affected a line of ancestry which goes back many million years to the time when life first appeared on earth," and his education, as the result of the totality of influences exerted upon him, we have been viewing education as a process rather than a means. The education of the schools, however, is both process and means, a process of individual development and a means of social development. From the standpoint of social evolution its function as a social means demands primary consideration.

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